US Army Corps
of Engineers
New York District

Reconnaissance
Report

Wappingers Lake
Dutchess County,
New York
Clean Lake Study

April 1993

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

July 12, 1993

Planning Division
Flood Control & Infrastructure Section

Mr. James B. Bain
Chairman, Wappingers Lake Committee
43 Liss Road
Wappingers Falls, New York 12590-1608

Dear Mr. Bain:

The New York District of the U.S. Army Corps of Engineers has completed the reconnaissance study of Wappingers Lake in Dutchess County, New York. A copy is enclosed.

Although our report outlines and documents the existing problems of aquatic growth, siltation and poor water quality, it does not recommend any additional Corps of Engineers involvement. Additional Corps involvement is prohibited since Wappingers Lake fails to meet the Corps' criteria for economic justification of high priority outputs such as flood control. As indicated in the report, dredging of the lake is not economically justified using our criteria. No other aspect of remediation may be accomplished under existing Corps regulations.

Accordingly, we have transmitted the report to the U.S. Environmental Protection Agency, Region II, for their consideration under the Clean Lakes Program. It should be noted that the Corps cannot formally request any project action of the EPA.

Congressman Fish's office has been informed of the study's conclusions.

If you have any questions, my point of contact is Mr. John P. Petrovich, who may be reached at (212) 264-8870.

Sincerely,

Bruce A. Bergmann
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

District Engineer

JUL 8 1993

Mr. William J. Muszynski
Acting Regional Administrator
Region II, U.S. Environmental
Protection Agency
26 Federal Plaza
New York, New York 10278

Dear Mr. Muszynski:

The New York District of the Corps of Engineers has recently completed a reconnaissance study of Wappingers Lake in Dutchess County, New York.

The reconnaissance report, dated April 1993, was prepared under authorization of the Water Resources Development Act of 1986, as amended by Section 403 of the Water Resources Development Act of 1990. The legislation authorized the Corps of Engineers to study the Wappingers Lake area to identify their needs to remove silt, aquatic growth and other material.

Our study identified that there is a severe problem of aquatic growth, siltation and poor water quality at Wappingers Lake. As Wappingers Lake fails to meet the Corps' criteria for high priority of [illegible] policy, [illegible] any further studies or remediation activities at this site.

In accordance with the authorizing legislation, I am forwarding the enclosed report to the Environmental Protection Agency for your consideration under the Clean Lakes Program.

If you have any questions concerning this study or report, please contact Mr. Michael S. Thompson of my staff. He may be reached at (212) 264-1060.

Sincerely,

Thomas A. York
Colonel, Corps of Engineers
District Engineer

Enclosure

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WAPPINGERS LAKE
DUTCHESS COUNTY, NEW YORK

April 1993

I. STUDY AUTHORITY

This report was authorized by Section 602 of the Water Resources Development Act of 1986 as amended by Section 403 of the Water Resources Development Act of 1990. Study initiation funds were provided by the Fiscal Year 1992 Appropriations Act.

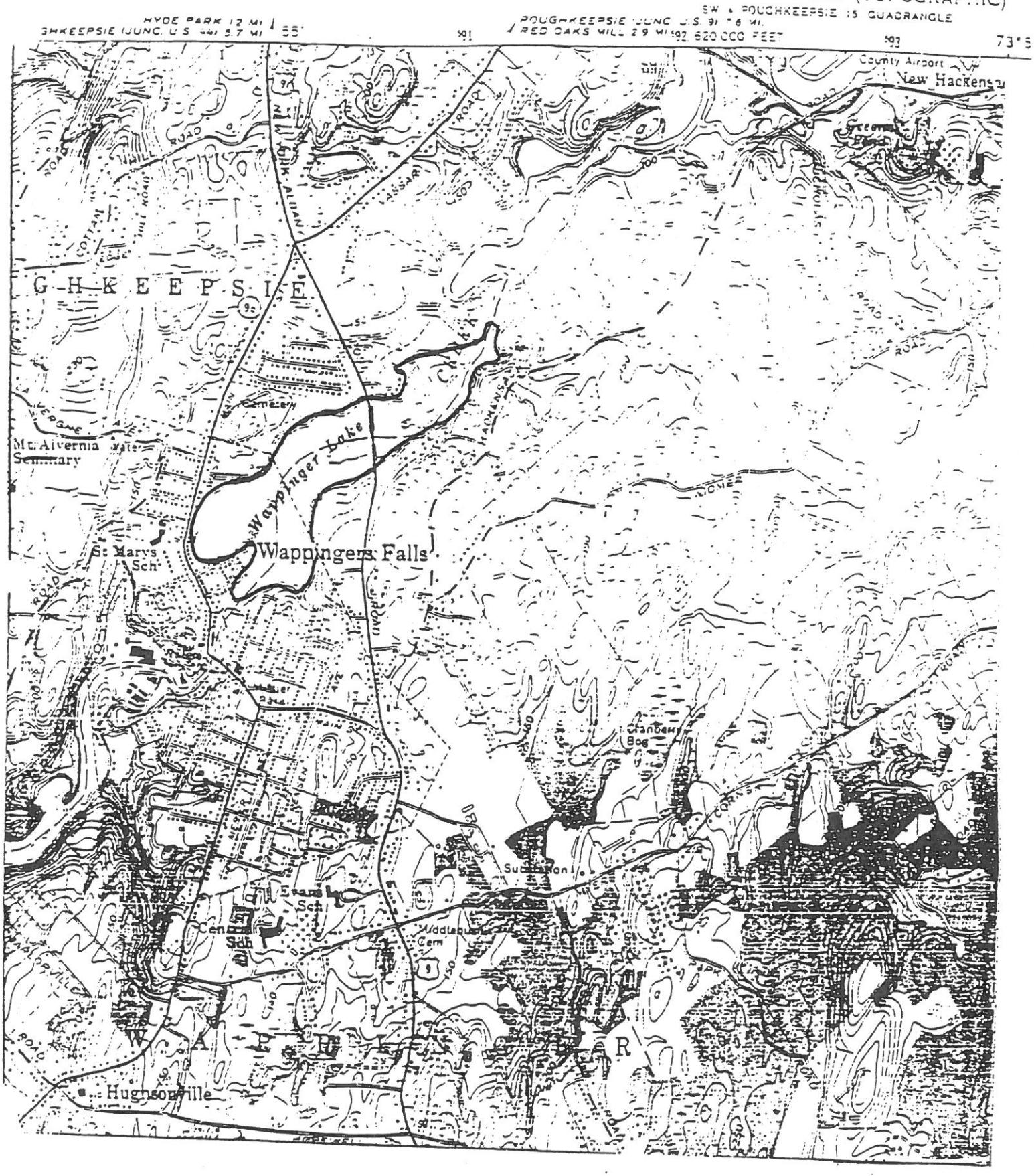
II. STUDY PURPOSE AND SCOPE

The study purpose of this reconnaissance-level study is to determine the extent of federal interest in a plan to remove silt and aquatic growth from Wappingers Lake in Dutchess County, New York. The study scope is to determine how the lake can best be restored, and the Federal and non-Federal roles. The potential benefits of a project would be improved water quality and recreational use of Wappinger Lake.

III. STUDY AREA

Wappingers Lake is located in Dutchess County in the Village of Wappingers Falls. It delineates the Towns of Poughkeepsie to the northwest and Wappinger to the southeast. Wappingers Lake is an approximately 88 acre man-made freshwater lake formed by the impoundment of Wappinger Creek, a tributary of the Hudson River. The lake feeds into the Lower Wappinger Creek which in turn flows into the Hudson River approximately 62 miles north of New York Harbor (Figure 1).

Wappinger Creek is within the Wappinger watershed (Figure 2). The watershed comprises approximately 210 square miles within the Lower Hudson Sub-basin. The drainage area is approximately 30 miles long, from the Town of Pine Plains toward New Hamburg at the southern tip of the Town of Poughkeepsie. The creek, north of Wappingers Lake is fed by three primary branches; Little Wappinger, the Main (Wappinger) Branch, and the East Branch, all of which converse near Salt Point in the Town of Pleasant Valley. The drainage basin includes large sections of the Towns of Washington, Pine Plains, Milan, Stanford and Clinton. This upper basin is primarily rural in character, whereas the lower basin is much more urban resulting in the Creek receiving runoff from some of the county's most highly developed areas.


WAPPINGERS FALLS QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW 4 POUGHKEEPSIE 15 QUADRANGLE
HYDE PARK 12 MI
POUGHKEEPSIE (JUNC.) U.S. 9W 5.7 MI
POUGHKEEPSIE (JUNC.) U.S. 9W 7.6 MI.
RED OAKS MILL 2.9 MI
620,000 FEET
73°5
County Airport
New Hackensa
POUGHKEEPSIE
Mt. Alvernia
Seminary
Wappinger Lake
St. Marys
Sch
Wappingers Falls
Cranberry
Bog
Sunset Lan
Evans
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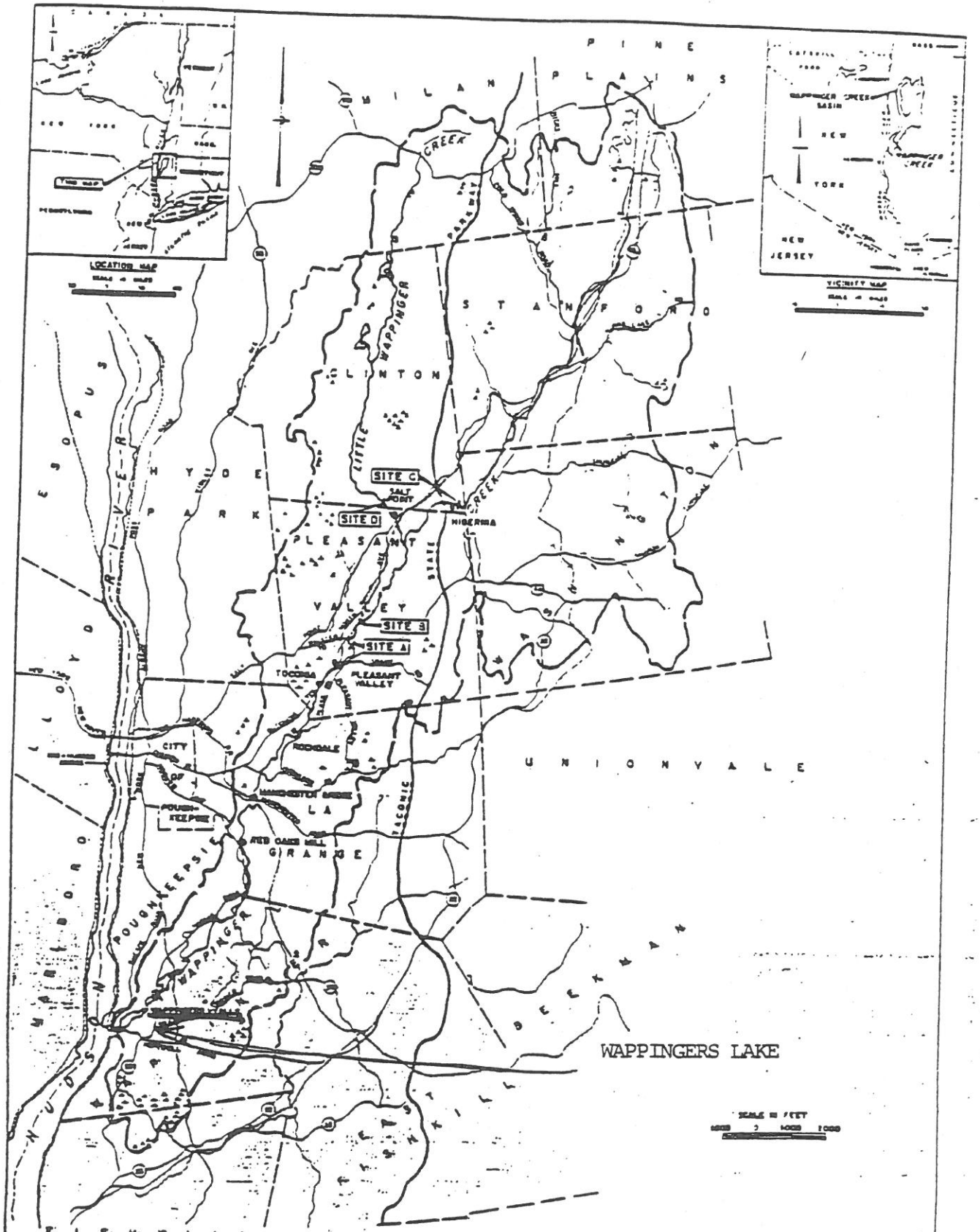
Cem
Sch
Middlebush
Cem
WAPPINGER
Hughsonville

FIGURE 1



WAPPINGER CREEK BASIN, NEW YORK
BASIN MAP

FIGURE 2

Wappingers Lake supports a variety of warm water fish as well as macro and microphyte flora and fauna. Recently a mix of invertebrate life forms and phytoplankton collected in the lake and recorded by Associates of Marist College numbered forty nine (49) taxa. Wappingers Lake in turn feeds into Lower Wappinger Creek which supports an even larger diversity of life forms. Indeed, Wappingers Lake, Falls and tidal Wappinger Creek comprise one of the areas listed as "significant" by the Dutchess County Environmental Management Council (EMC). Lower Wappinger Creek has been designated as a Significant Coastal Fish and Wildlife Habitat by the New York State Division of Coastal Resources and Waterfront Revitalization (NYS, 1990). Impacts on the water quality of Wappingers Lake directly impacts the warmwater fishery and other habitats not only in the Lake but in the Lower Wappinger "significant area" in its entirety, including striped bass spawning in the tidal creek. (See the Environmental Appendix for further information).

Approximately 90% of the lake shore is privately owned, with the remainder serving as parkland. The lake is currently open to the public for limited recreational activities (light boating, fishing, etc.) without residential restrictions.

IV. CULTURAL RESOURCES

The area beneath and immediately adjacent to Wappingers Lake has a high potential for the existence of cultural resources that may be eligible for listing on the National Register of Historic Places (NRHP; see Cultural Resources Appendix for a more detailed analysis). By the time of the arrival of Europeans to New York State, several Native American groups, including the Wappingers Indians, lived in the vicinity of the lake. A number of Native American sites have been documented nearby the project area. These sites include a burial site, a village site, and numerous quarry sites. During the 19th and early 20th centuries, Native American artifacts were often found along the banks of Wappinger Creek.

The historic period of Wappingers Falls begins in the middle of the 17th century with the purchase of the land known as the Rombout Patent, which included the Village of Wappingers Falls, and the Towns of Fishkill, East Fishkill, Wappinger, and La Grange by merchants from New York City. Some of the earliest landowners established grist- and

sawmills in the area which utilized the waterpower of Wappinger Creek. During the 19th century, these mills were replaced by cotton mills and print works.

The first substantial masonry dam built across Wappingers Creek was constructed in the 1840s and a small lake was created behind it. Several dams were constructed during the 19th century by the various textile mills located along the creek as floods damaged or destroyed previous ones. In 1910-11 the present concrete dam was built by the Dutchess Bleachery and the lake attained its current size.

Since the silt that has accumulated on the lake bottom has not been dredged, there is the potential for locating prehistoric and historic archaeological remains within and on top of the pre-lake ground surface. These sites would have been covered gradually as the lake developed over time. Dredging the lake or other activities that would disturb the lake bottom may impact these deposits.

V. PROBLEM DESCRIPTION

Wappingers Lake had an approximate depth of fourteen (14) feet in 1914. Since that time the years of soil erosion from throughout the watershed with subsequent siltation has reduced the lake depth dramatically. Measurements taken by the Dutchess County Department of Planning in as early as 1972 shows a significant portion of the lake with reduced depths of five and a half to seven (5.5-7.0) feet and smaller areas nearer the shore with a lake depth of under five feet. More recently a 1992 lake drawdown of 2.5 feet exposed substantial portions of lake bottom. If this pattern continues, as the natural pattern of ecological succession from lake to marshland suggests it will, the continued silting in of Wappingers Lake will soon make much of the lake inaccessible for fishing and boating, its primary uses.

Lake depth reduction has been compounded by the invasive growth of water chestnut (Trapa natans). The water chestnut growth has expanded to literally cover the entire lake (excluding a 20 foot wide cleared swath through which boats navigate from a boat rental facility).

Water chestnut is a particularly virulent nuisance. Listed as one of the exotic plants with identified detrimental impacts on wildlife habitats in New York State, water chestnut can make boating, fishing or swimming difficult or impossible. The fruiting bodies, or nuts,

contain sharp spines capable of inflicting injury, while the vegetative growth has been shown to accelerate sedimentation by trapping silt. Water chestnut may also have a detrimental effect on water quality in that organic material derived from water chestnut may be a precursor to toxic trihalogenated methanes. Dissolved oxygen content deep within the water chestnut beds has been shown in limited areas, to decrease dramatically, and may even have led to fish kills. (Further information on the adverse impacts of water chestnut is included in the Environmental Appendix).

An additional problem with water quality is caused by algal blooms (most probably blue-green algae) during the summer months. This is not surprising as when high organic, low oxygen conditions coincide with the peak growing season for algae and macrophytes the incoming nutrients act as fertilizer encouraging excessive algal and macrophyte growth. These blooms are also malodorous, and act as a deterrent to the recreational uses of Wappingers Lake.

The Lake sedimentation processes and algal blooms are both results of activities not limited to the Village of Wappingers Falls, but which occur throughout the watershed. Thomas described this situation very clearly in "Natural Resources of Dutchess County" (Thomas, 1985), "Upstream erosion and pollution are gradually choking many of the county's lakes and ponds. Materials carried downstream fill the lakes with silt and accelerate the natural eutrophic process through which lakes evolve into dry land."

VI. OBJECTIVES

The objectives of this study were to identify alternatives for accomplishing the legislative goals and to determine the degree of federal interest in the project. Included in these objectives is the determination (on a reconnaissance level) of the extent and root causes of the problems limiting water quality and recreational use of Wappingers Lake.

VII. PREVIOUS STUDIES AND REPORTS OF THE U.S. ARMY CORPS OF ENGINEERS

A feasibility study for Wappinger Creek was prepared by the Corps of Engineers, New York District. This resulted in a project authorized pursuant to Section 212 of the 1950 Flood Control Act providing for replacement of a floodwall and closure levee and lowering of the existing dam at the Village

of Pleasant Valley. Construction was carried out in 1958. A subsequent Survey Report for Flood Control for the Wappinger Creek Basin dated November 1970 recommended that a Federal flood control project be constructed at Pleasant Valley. This project was not authorized for construction and no further Federal action in the basin has been pursued.

VIII. STUDY APPROACH

Section 602 Lake Program section of PL 99-662 dated November 17, 1986 stated that the Secretary of the Army shall carry out programs for the removal of silt, aquatic growth, and other material and shall report to the Administrator of the Environmental Protection Agency, the plans for and results of the program, together with such recommendations as the Secretary determines necessary to carry out the program for freshwater lakes under section 314 of the Federal Water Pollution Control Act. This Section was modified by Section 403 of the Water Resources Development Act of 1990 to add Wappingers Lake as to those previously covered by the Section 602 Lakes Program. Accordingly, the study approach was to develop data to meet the Congressional intent under Section 602. The findings and conclusions of this study are recommended to be transmitted to the Director of the Environmental Protection Agency for inclusion of Wappingers Lake into EPA's Clean Lakes Program.

A description of some of the alternatives examined is contained in the following sections. These include pursuing direct action by the Army Corps of Engineers, utilizing the ACOE Army Corps of Engineers Aquatic Plant Control Program or the possibility of accessing the EPA Clean Lakes Program.

IX. DEVELOPMENT OF ALTERNATIVES

A traditional Corps-planned project would include development and analysis of a full range of structural and non-structural plans, and plan elimination based on engineering feasibility, economic viability, environmental considerations and public acceptability. As the problems at Wappingers Lake are primarily environmental in cause, a different approach has been utilized. Any proposed alternative should integrate environmental management techniques (and possible structural (engineering) components) to successfully resolve the problem.

STUDY CONCLUSION

We have determined that the root causes of the problems limiting water quality and recreational use of Wappingers Lake extend far beyond the boundaries and resources of Wappingers Falls, N.Y. This alternative section will deal with both the programs Wappingers Falls might access for assistance, as well as potential problem solving measures.

#1

a. Access the US Army Corps of Engineers (ACOE) for Assistance (i.e. dredging)- ACOE activities beyond a reconnaissance study must be justified by a positive benefits:costs ratio. Present guidance is that these benefits cannot be primarily low priority benefits. Unfortunately, water quality and recreational benefits are classified as low priority. The Army Corps of Engineers, is therefore, under present guidelines, unable to authorize further study and implementation of corrective action for Wappinger lake.

A secondary consideration of ACOE in chosing its solution alternatives is the attempt to provide as long term a solution as possible. While dredging would certainly restore recreational use to Wappingers Lake through both lake deepening and removal of much of the invasive water chestnut, the benefits achieved would have a limited life span. Dredging would most probably not remove all the water chestnut fruiting bodies. Reinvasion would occur, and unless effective water chestnut control measures were put into effect water chestnut would quickly impede recreational use of the lake once again. As the water chestnuts act as an effective silt curtain, their presence would again accelerate the process of siltation of Wappingers Lake. In addition, while dredging would indeed remove nutrient rich sediments it would not impede the nutrient loading which occurs from runoff throughout the watershed. Algal blooms would most likely continue to be a persistent problem even after a dredging operation.

b. Access the Aquatic Plant Control Research Program (APCRP)- The New York District COE administers the Aquatic Plant Control program for navigable water, tributary streams, connecting channels and other allied waters within the district. The Corps of Engineers' Aquatic Nuisance Control Program is authorized by Section 302 of the River and Harbor Act of 1965, Public Law 89-298, 89th Congress approved 27 October 1965, which authorized a comprehensive program to provide for control and progressive eradication of water-hyacinth, alligator weed, Eurasian watermilfoil, and other obnoxious aquatic plant growths from the navigable waters, tributary streams, connecting channels and other allied

waters of the United States, in the combined interest of navigation, flood control, drainage, agricultures, fish and wildlife conservation, public health and related purposes, including continued research for development of the most effective and economic control measures, to be administered by the Chief of Engineers, under the direction of the Secretary of the Army, in cooperation with other Federal and state agencies.

The Aquatic Plant Control Research Program guidelines have been interpreted under similar lines as ACOE general guidance. APCRP is not authorized to take on a project whose primary benefit is low priority (in this case recreational). As this is clearly the case this program is unavailable to Wappingers Lake, under current policy guidance.

c. Access the EPA Clean Lakes Program: The problems of Wappingers Lake, deteriorating water quality and recreational use clearly fall within the guidelines of EPA's Clean Lakes Program. The Clean Lakes Program functions in two phases: Phase I- diagnostic, and Phase II- implementation. Wappingers Falls, having attempted to deal with this problem for some time, may have sufficient information to apply directly to a Phase II study. An application would need to be submitted through the New York State Department of Environmental Conservation to EPA throughthe Program Coordinator for Region II. (See the Environmental Appendix for further details).

A possible approach through the Clean Lakes Program could be to develop both a short term, limited plan, as well as a long term comprehensive proposal. The following measures could be included, (all of which are developed more thoroughly in the Environmental Appendix):

1. Short-term improvement of Wappingers Lake for recreational use and water quality- Such an improvement would be dependent upon improved water chestnut control and decreased sediment and nutrient loading.

a. Water chestnut control- improved control could be through the following measures:

i. Airboat rosette removal- Airboats can be utilized to enter areas too shallow for a harvester to enter. A cutter blade can be attached so that as the airboat travels the rosettes (flowering bodies) are cut approximately four inches (4") below the water surface. ii. Sediment covers- Areas too

shallow for even an airboat to successfully traverse can achieve water chestnut control through the use of sediment covers, or gas permeable screens.

iii. Dredging- A dredging operation could be an effective short-term solution to the deteriorating recreational use of Wappingers Lake. Obviously, the greater the depth to which the lake is dredged the longer the grace period until sedimentation once again becomes problematic. Control of both water chestnut and algal blooms will be augmented for the short term. By removing the sediment we will have removed much of the water chestnut nuts as well as increased lake depth. These improvements will last only until sediment and nutrient loading, as well as water chestnut dispersal again overwhelms the system.

The dredging method under consideration, as most efficient and cost effective, for the Wappingers Lake project is the clamshell method. The aquatic plant material which has accumulated on the lake bottom would clog up more traditional dredging equipment, and result in time-consuming delays.

The channel and other limited areas of the lake remain relatively deep. The assumption was therefore made that approximately 50% of the lake area would be dredged. As samples taken of the lake bottom reveal no toxic levels of hazardous materials (See Environmental Appendix) dredging appears a viable action.

The average depth of the lake under current conditions is 5 feet. The preliminary plan is to dredge the defined areas of the lake seven feet to a final depth of 12 feet. The 12 feet depth goal was set to preclude disturbing any potential prehistoric or historic archaeological remains. (See the Cultural Resources Appendix for further details).

The average dredging cost has been estimated at approximately eight to eleven dollars per cubic yard, dependent upon disposal site location. The cost for dredging operations alone, based on the aforementioned assumptions, was calculated at four to six million dollars, or an estimated cost of five million dollars. At the current government discount rate of 8 1/4%, the annual cost over a 50 year project life would be $420,500. As the boating swimming recreational benefits were estimated at $137,600 and the fishing recreational benefits estimate at about $72,000 (totalling $209,600) the benefit-cost ratio for the dredging operation alone, is 0.5 to 1. (For further information see

the Economic Analysis Appendix).

b. Sediment loading reduction- Construction sites are large contributors to soil erosion. Such disturbed areas in close proximity to Wappinger Creek can be identified and short term sediment control achieved through the use of sediment traps. These traps, or temporary structures can be made of sandbags, straw bales or stone and may detain runoff for short periods of time so heavy sediment particles will settle out.

c. Nutrient loading reduction- Little reduction of nutrients can be achieved at the local level. Limited measures may include coordination by lake homeowners with local soil conservation experts on optimum fertilizer and pesticide use. Gutters should be removed so that runoff occurs over vegetated areas where nutrients can be taken up. More comprehensive effective measures will need to be included in the long term proposal.

2. Long-term comprehensive proposal- Any long-term proposal would need to incorporate watershed-wide management plans to reduce nutrient and sediment loadings. As nutrients and sediment enter Wappinger Creek from throughout the watershed as a sort of non point source pollution, control measures must address the issue throughout the watershed. Potential watershed management control measures may include:

a. Sediment loading reduction- This can be achieved either through reducing the amount of sediment entering Wappinger Creek and its tributaries (sediment diversion) and/or reducing the amount of sediment already within the Creek that reaches Wappingers Lake (sediment detention).

i. Sediment diversion- Diversion structures should be placed in those areas identified as the greatest sediment contributors. Potential areas of great sediment input are those adjacent to Wappinger Creek , and its tributaries, on steep slopes, and of soil types with relatively high soil erosion characteristics. (See the Environmental Appendix for more detail).

ii. Sediment detention- Sediments can be detained within the Creek by the development of sedimentation basins. If designed correctly, the larger silt particles should settle out in the basins prior to reaching Wappingers Lake. The size and shape of the basins is dependent upon soil particle size, water velocity and flow. The most effective placement of the basins is in areas where the water velocity is already decreased

within the system. Water velocity will have to be gaged throughout Wappinger Creek and tributaries to determine optimum placement. Sedimentation basins are part of a long-term management plan in that upkeep in the form of periodic silt removal from the basins is essential.

iii. Nutrient loading- Agricultural runoff can be handled through diversion or control. Runoff diversion is the diversion of stormwater runoff to either existing wetlands (common throughout the system) or through the construction of wetlands at major input areas. Runoff control could utilize agricultural practices such as conservation tillage, contour farming, contour stripcropping, integrated pest management, terracing, and animal and fertilizer waste management to reduce runoff.

X. FINDINGS AND CONCLUSIONS

The Water Resources Development Act of 1986's Section 602 as amended by Section 403 of the Water Resources Development Act of 1990, authorizes the Secretary of the Army to carry out a program for the removal of silt, aquatic growth, and other material from Wappingers Lake. Section 602 (c) also states that the Secretary of the Army shall report to the Administrator of the Environmental Protection Agency the plans and results of the program under subsection (a), together with such suggestions as the Secretary deems necessary to carry out the program for the freshwater lakes under Section 314 of the Federal Water Pollution Control Act. In selecting suggested plans for each project in the Environmental Protection Agency's Clean Lakes Programs, the Corps is to choose the alternative that best achieves the program's objective in the most environmentally sensitive and cost-effective manner.

The study was prepared under this guidance. It should not be construed that the Corps of Engineers will implement the plan. Section 602 (c) states that: "The Secretary (of the Army) shall report to the Administrator of the Environmental Protection Agency the plans for and the results of the program under subsection (a) together with such suggestions as the Secretary (of the Army) determines necessary to carry out the program for freshwater lakes under section 314 of the Federal Water Pollution Control Act". The Environmental Protection Agency is likewise not obligated to include Wappingers Lake in its Clean Lakes Program. That decision is its alone to make.

The findings and conclusions described in this report

are responsive to the legislation, and the transmittal of this decision document to the Director of the Environmental Protection Agency constitutes the completion of the Corps of Engineers' portion of the project.

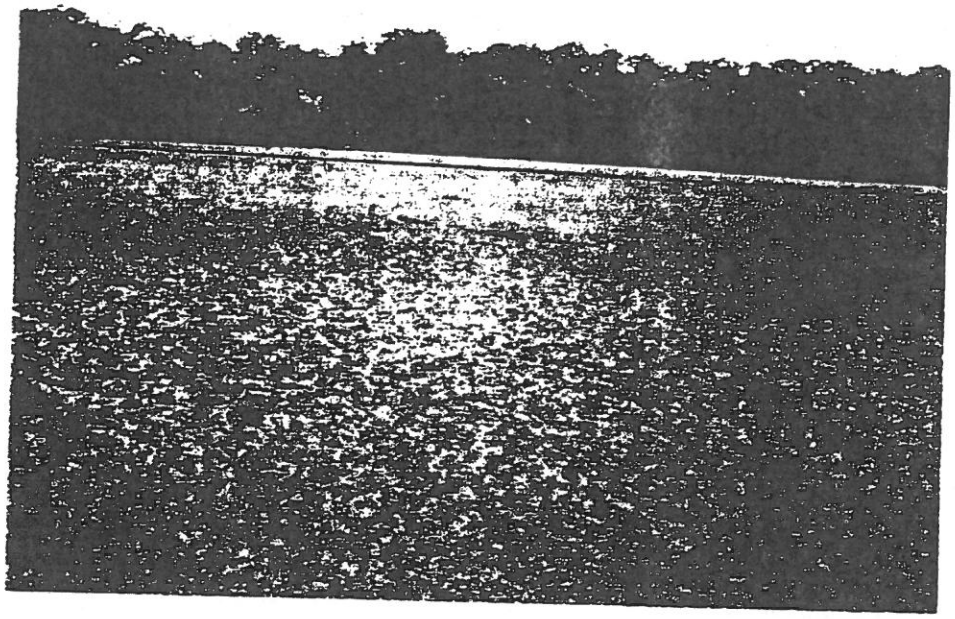
The examination of the Wappingers Lake silt, aquatic growth and sediment removal study in Wappingers Falls, New York was conducted in response to the enabling legislation - to select the least environmentally damaging and most cost effective plan. Since the study was conducted under the auspices of the Corps of Engineers, its criteria relative to determining if there is an economically feasible solution with Federal interests were also applied.

There is no Corps recommended project at this time under current Corps criteria for traditional water resources development purposes or under the Environmental Initiatives program. The dredging portion of the plan is not economically justified. The Army Corps of Engineers cannot commit the Environmental Protection Agency to this study. If, however, the U.S. EPA were to implement a dredging plan and complement it with an extensive watershed management program (which could include the elucidated techniques) as well as an effective water chestnut control program, there is potential for an effective long-term solution for the study area.

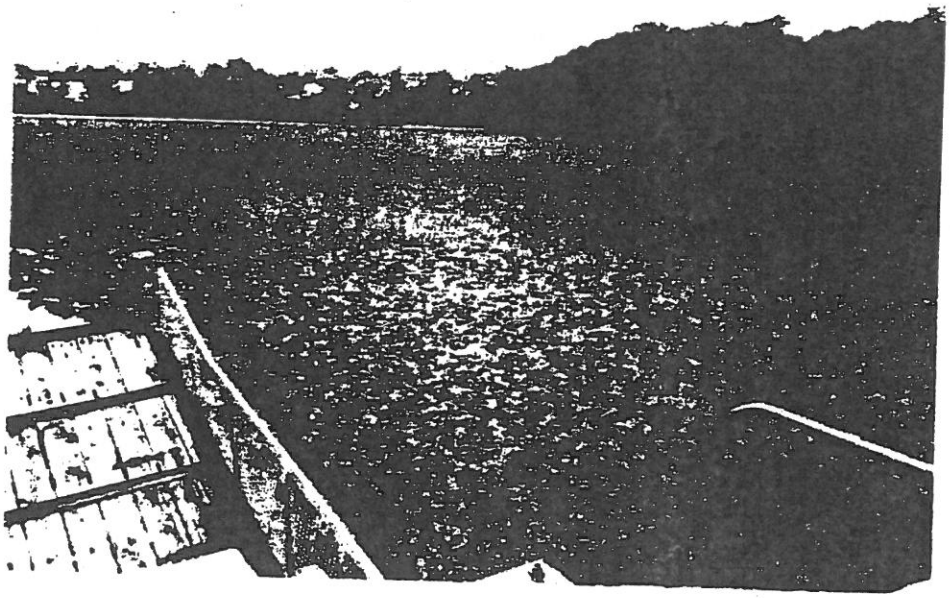
XI. RECOMMENDATIONS

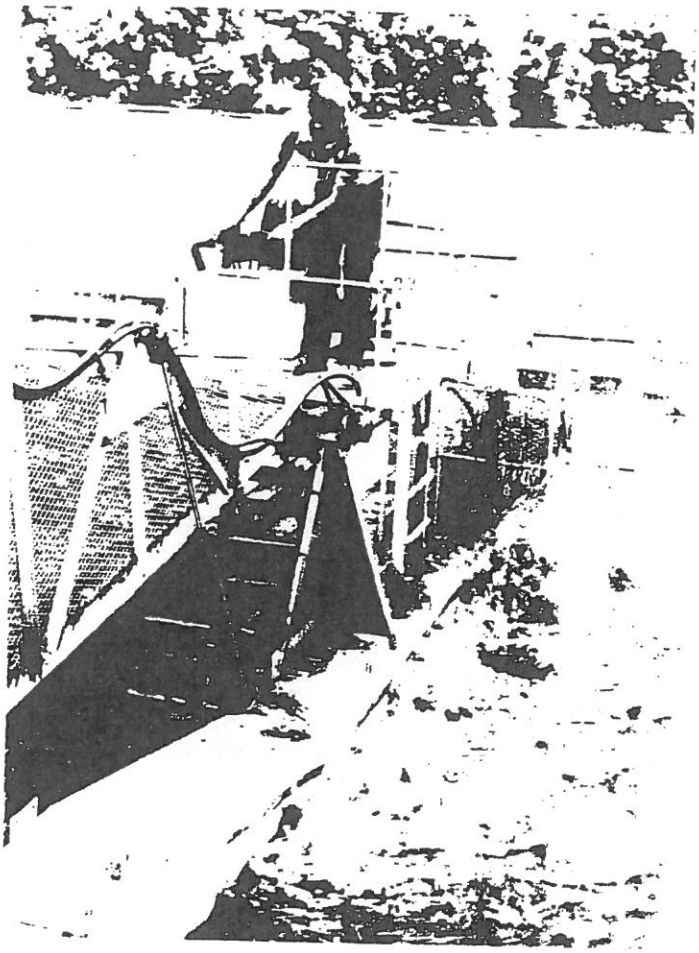
Enduring improvement of the recreational uses and water quality of Wappingers Lake requires a comprehensive long term approach to watershed management. This report attempts to offer limited guidance in the possible techniques to be utilized in such an approach. On the basis of the above findings, I am transmitting this report to the Administrator of the Environmental Protection Agency. It may be used as possible guidance should the Environmental Protection Agency choose to include Wappingers Lake in its Clean Lakes Program.

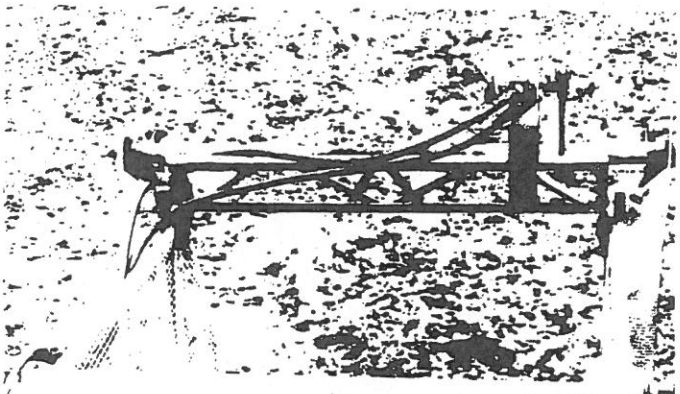
THOMAS A. YORK
Colonel, Corps of Engineers
District Engineer

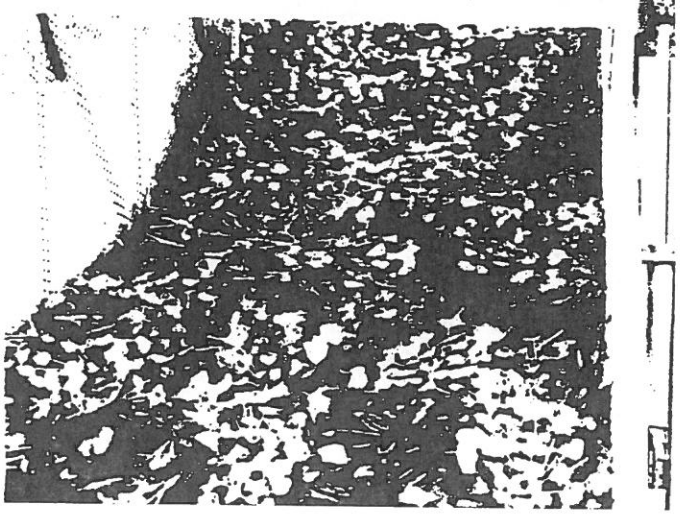


Views of Wappingers Lake During
Summer 1992 Showing of Aquatic Growth

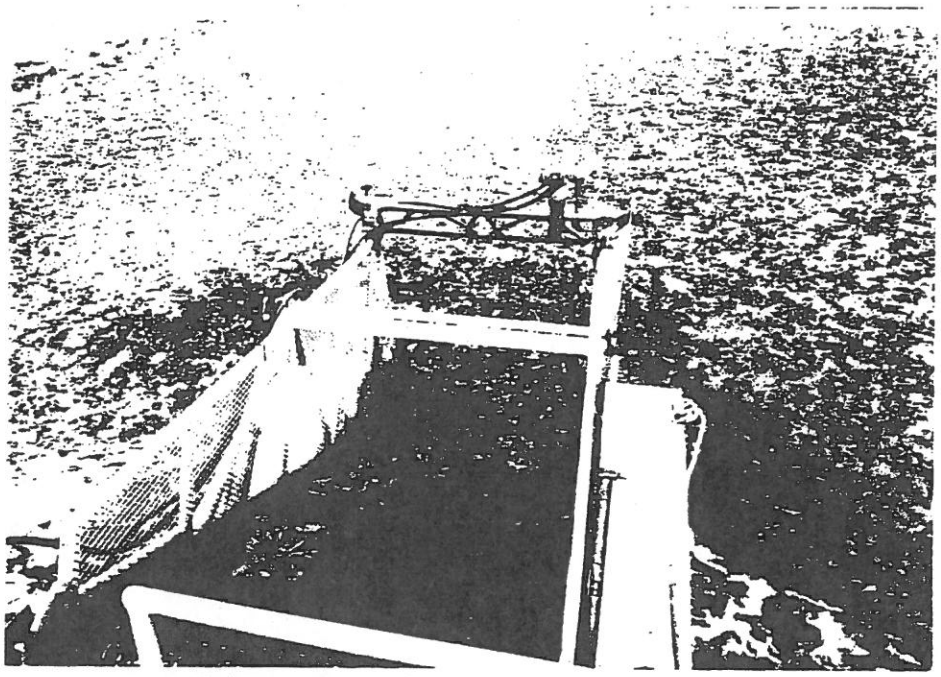








Local Harvester
In use at Wappingers Lake
During Summer 1992



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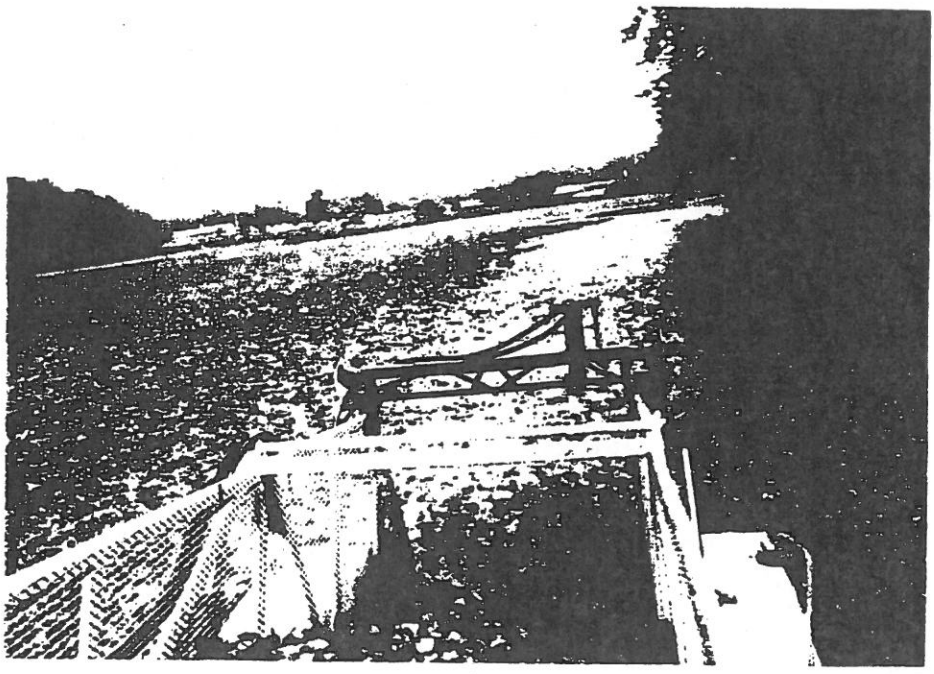
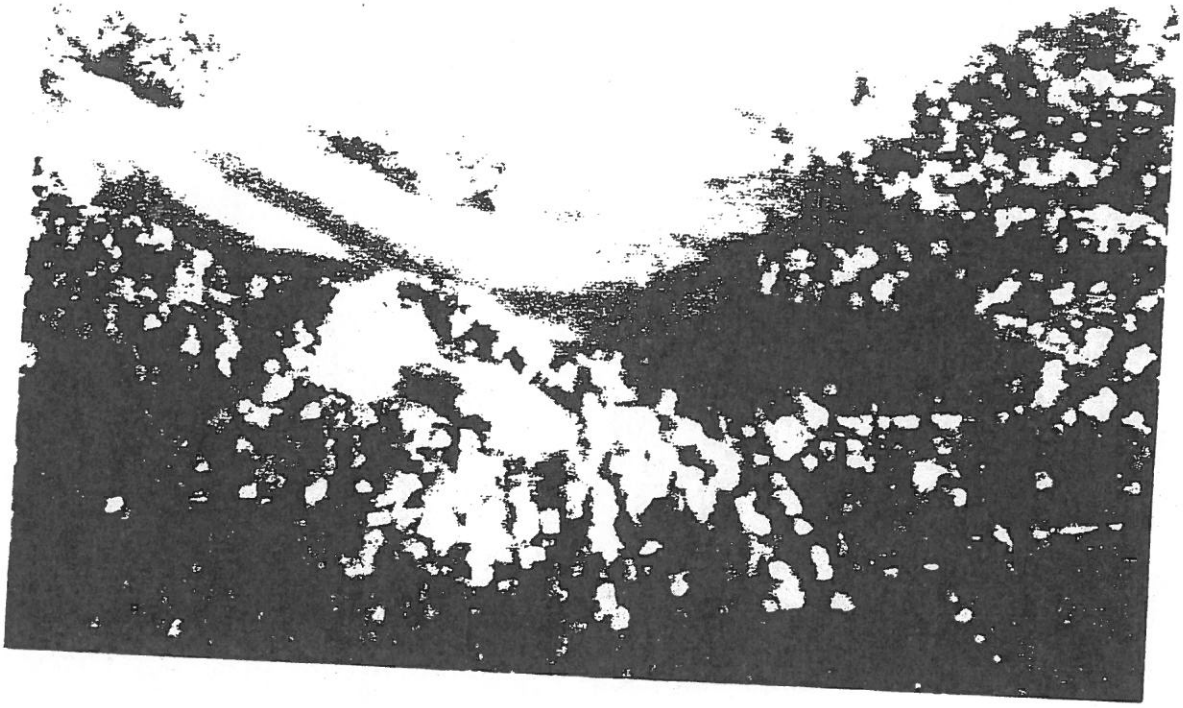
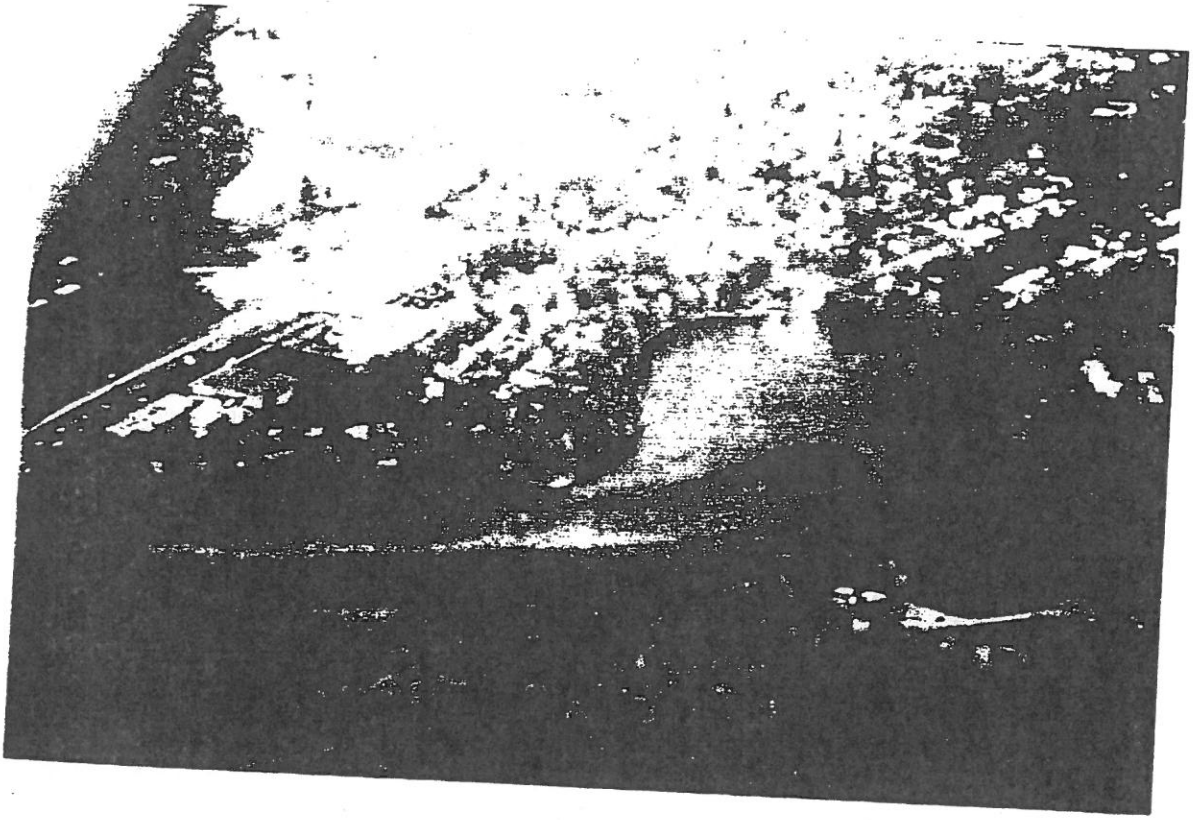




Aerial View of Wappingers Lake During
Drawdown in Fall 1992 for Dam Repair



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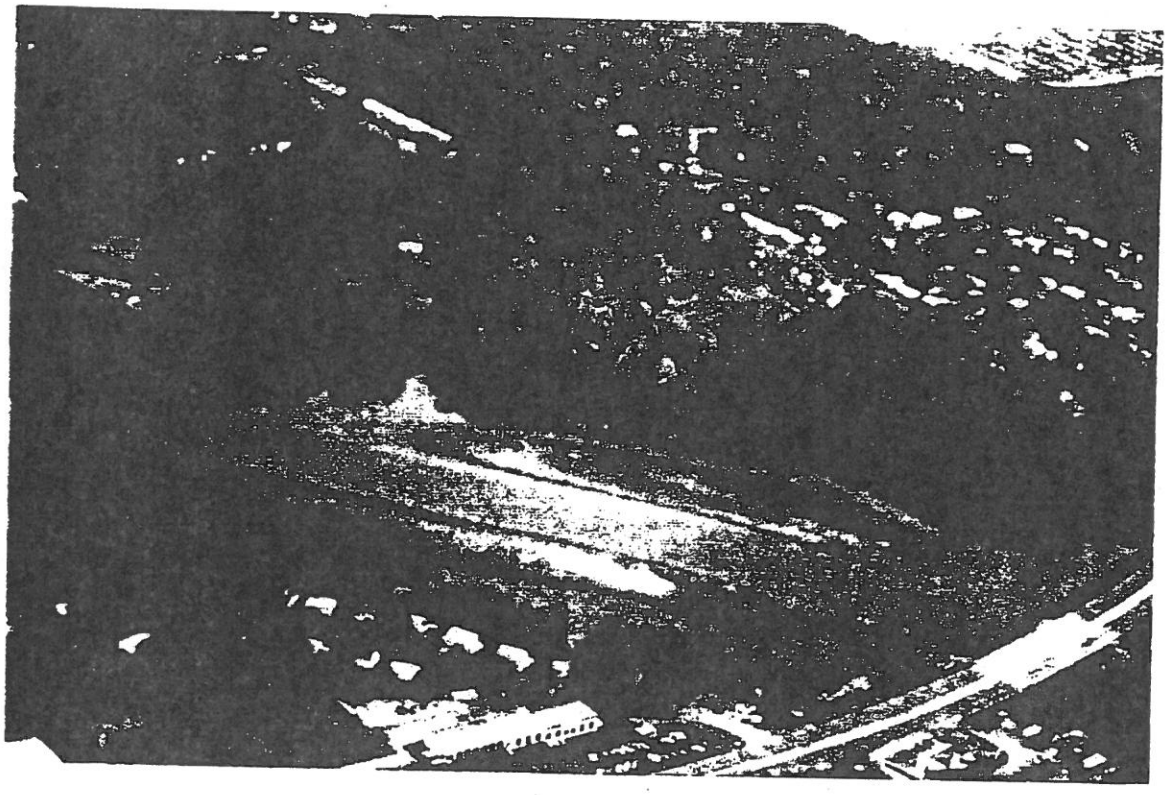

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